bladed grasses. Group X., hairy grasses. Group XII., ribless bladed grasses. Groups VI., IX., and XI. are separately dealt with, but those above-mentioned will sufficiently show the principle upon which the classification is made.

The figures (diagrams), showing the tapering, obtuse, flat, involute, or imbricate character of the herbage, are exceedingly plain and characteristic, and will be of great assistance to the observer in the field. The leaf-blades, stems, ligules, sheaths, &c., are well shown in cross-sections, and at length. JOHN WRIGHTSON.

OUR BOOK SHELF.

Facsimile Atlas to the Early History of Cartography, with Reproductions of the most important Maps printed in the Fifteenth and Sixteenth Centuries. By A. E. Nordenskiöld. Translated from the Swedish original by J. A. Ekelöf and Clements R. Markham. (Stockholm, 1889.)

IN this handsome volume there are 142 pages of letter-press in imperial folio, and 51 plates in double folio. It contains reproductions of about 160 of the rarest and most important maps printed before the year 1600. Among these are the 27 maps of Ptolemy, edited by Schweinheim-Buckinck in Rome, 1478 and 1490; maps from Berlinghieri's "Geographia," Firenze, c. 1478; Aeschler's and Übelin's "Ptolemy" of 1513: Reisch Margarita Philosophica, of 1503 and 1515; Lafreri's "Atlas," Romæ, c. 1570; Richard Hakluyt's "Petrus Martyr," Paris, 1587, and "Principal Navigations," London, 1599; maps of the world, by Ruysch, 1508, Bernardus Sylvanus, 1511, Hobmicza, 1512, Apianus, 1520, Laurentius Frisius, 1522, Robert Torne, 1527, Orontius Finacus, 1531, Grynæus, 1532, Mercator, 1538, Girava, 1556, de Judæis, 1593. We find also the first modern printed maps of the northern regions, of the Holy Land, of Central Europe (by Nicolas a Cusa), of France, of Spain, of England, of Russia; the first charts for the use of mariners published in print; 82 general maps, or maps referring to the New World; the first modern printed maps of Africa; the first map illustrating the distribution of religious creeds, &c.

As regards the text, chapters i.–iii. contain researches relating to the influence of Ptolemy on modern cartography, his merits and defects, and the different editions of his geography. Of the editions enumerated in bibliographical works, 27 spurious ones are neglected. In chapter iv. a review is given of ancient maps other than Ptolemaic, of the portolanos and their influence on modern geography. Chapter v. treats of the extension of Ptolemy's *Oikumene* towards the north and north-west, the pre-Columbian maps of Scandinavia and Greenland, the most remarkable of which is one discovered by Nordenskiöld himself in a library at Warsaw (reproduced on Tab. xxx.) Chapter vi. deals with the first maps of the New World, and the then recently discovered parts of Africa and Asia. Here the author draws attention to the hitherto neglected fact that maps from Vasco de Gama's second voyage were printed as early as 1513 (reproduced in the letterpress, Figs. 8–10). Chapter vii. gives an account of early terrestrial globes, and in chapter viii.—on map projection—the author corrects several errors generally adopted in the history of this part of cartography. In chapter ix. he deals with the end of the early period of cartography, and in chapter x. with the transition to, and the beginning of, the modern period. He brings out the importance of the work of Jacopo Gastaldi, Philip Apianus, Abraham Ortelius, and Gerhard Mercator, in the development of cartography. He also gives, besides a catalogue of the maps in Lafreri's "Atlas," a critical review of Ortelius's celebrated "Catalogus Auctorum tabularum geographicarum."

The work is based on Baron Nordenskiöld's private collection of ancient printed maps. This collection he began to make many years ago, and it is now rich in documents from the periods reviewed in the present "Atlas."

The maps have been excellently copied and printed, and the great care taken by the librarian, Mr. W. E. Dahlgren, has secured the correctness of the citations. All geographers who have a right to an opinion on the subject will agree that the work is indispensable to every library in which there is a department devoted to geography.

Light and Heat. By the Rev. F. W. Aveling, M.A., B.Sc. Second Edition. (London: Relfe Bros., 1890.)

THIS is a new edition of a text-book intended to prepare candidates for one of the science subjects of the London matriculation. It has been much improved since its first appearance, but it still treats the subject in a very superficial way. Although no one could seriously study the subject with this as a guide, it is certainly a useful summary of the main facts, and will probably be found serviceable by intending candidates. The coloured plate of spectra has been corrected, but surely this is superflous in a book which does not even describe an ordinary student's spectroscope. The author has fallen into the very common error of stating that the electric arc gives a continuous spectrum, and he also states that the lines in the spectra of the fixed stars are different from those which characterize sunlight; whereas in a great many cases they are practically identical.

There are numerous diagrams, but they are barely of a quality equal to those which would be produced by a student at an examination. The large collection of questions and answers will be very useful.

Warren's Table and Formula Book. By the Rev. Isaac Warren. (London: Longmans, Green, and Co., 1889.)

WE have in this small work a compact and trustworthy set of tables, facts, and formulæ which come within the scope of an ordinary education. As a reference book, it should prove most useful, the information it conveys being concise and to the point. In addition to the usual tables of weights and measures, &c., we have an account of the physical and electrical units now in use, followed by the most important formulæ used in algebra, mensuration and trigonometry, and tables of exchange, principal units of value throughout the world, and comparative average values of some important coins, the last of which will doubtless be found useful to those travelling abroad. Some of the most important business forms, such as "Form of a Joint Promissory Note," "Form of Foreign Bill of Exchange," &c., are printed in full; and the work concludes with postal and telegraph rates. On the back of the cover are printed diagrams of a square decimetre and centimetre and a square inch, together with scales of centimetres and inches.

LETTERS TO THE EDITOR.

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of* NATURE. *No notice is taken of anonymous communications.*]

"Panmixia."

THE somewhat strained argumentation which Mr. Romanes has devoted in your issue of April 3 (p. 511) to my defence of Mr. Darwin's position in regard to "cessation of selection" and "economy of growth" does not convince me of the justice of the former's claim to have originated new principles "unfortunately" (to use his own expression) too late for Mr. Darwin to have the advantage of correcting himself by their aid. In his letter of March 13 (p. 437) Mr. Romanes lays great stress in

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criticizing Weismann upon what he calls "reversal of selection," which he now tells us is the same principle as "economy of growth." Yet in the earlier letter he entirely omits to credit Mr. Darwin with the recognition of that principle, and after carefully asserting that Mr. Darwin had overlooked the principle of "panmixia," he gives in an historical form what *he* (Mr. Romanes) had argued some years ago, and what *his* views were—including herein the principle of economy of growth, or more generally, reversed selection. Now that the oversight has been pointed out to him Mr. Romanes allows that "it is a matter of familiar knowledge that Mr. Darwin at all times, and through all his works, laid considerable stress upon the economy of growth (or more generally, reversed selection)."

Mr. Romanes makes an unreal separation between "cessation of selection" and "reversal of selection"; at the same time, for the mere purpose of *badinage*, he affects to suppose that I do not perceive any difference between them—a supposition which cannot be sincere in view of the statements in my letter of March 27. Cessation of selection is not a "principle" at all. It is a condition which alone cannot produce any important result. At the same time, what Mr. Romanes misleadingly calls "reversal of selection," viz. "economy of growth," cannot become operative in causing the dwindling of an organ until the condition of "cessation of selection" exists. The fact is—as Mr. Romanes insisted before it was pointed out in these pages that it was no new principle of his own discovery, and when he wished to lay claim to an improvement upon Weismann's exposition of "panmixia"—cessation of selection must be supplemented by economy of growth in order to produce the results attributed to "panmixia." And inasmuch as economy of growth as a cause of degeneration involves the condition of cessation of selection, Mr. Darwin, in recognizing the one recognized the other.

By the use of the term "the principle of the cessation of selection" Mr. Romanes has created an unnecessary obscurity. To say that a part has become "useless," or "has ceased to be useful to its possessor" as Mr. Darwin does, is clearly the same thing as to say that it "has ceased to be selected"—selection and use being inseparable. Mr. Darwin states that such parts "may well be variable, for their variations can no longer be checked by natural selection." That is panmixia. It is true that Mr. Darwin did not recognize that such unrestricted variation must lead to a diminution in size of the varying part without the operation of the principle of "economy of growth." This was no strange oversight: he would have been in error had he done so. On the other hand, he did recognize that, given the operation of that principle, the result would amount to the dwindling and degeneration of parts which are referred to as rudimentary.

"Panmixia" as a term clearly refers to the unrestricted interbreeding of all varieties which may arise, when selection in regard to a given part or organ is no longer operative. The term, like its correlative "cessation of selection," does not indicate a principle but a natural condition: it does not involve the inference that a dwindling in the *size* of the organ must result from the inter-breeding; but simply points to a precedent condition.

I am by no means prepared to admit that panmixia alone (*i.e.* without economy of growth or other such factors) can be relied upon, as it is by Mr. Romanes, to explain the reduction in size of the disused organs of domesticated animals. I observe that in his letter on this subject to NATURE of April 9, 1874, Mr. Romanes does not attempt to attribute a dwindling action to "panmixia" alone, but assumes a limitation by economy of growth to any increase beyond the initial size of the organ which has become useless. Given this limitation and the condition of panmixia, the dwindling follows; but it is absurd to attribute the result, or any proportion of it, to the panmixia or cessation of selection alone. On the other hand, when we consider shape and structure, and not merely size, it is clear that panmixia without economy of growth would lead to a complete loss of that complex adjustment of parts which many organs exhibit, and consequently to degeneration without loss of bulk. That the principle of economy of growth is ever totally inoperative has not been demonstrated. E. RAY LANKESTER.

April 9.

Heredity, and the Effects of Use and Disuse.

ALL biologists will, I am sure, agree as to the desirability of a thorough testing of the hypotheses relative to the inheritance of the effects of use and disuse. As Mr. Spencer says, in the preface to "The Factors of Organic Evolution":—"considering the width and depth of the effects which acceptance of one or other of these hypotheses must have on our views of Life, Mind, Morals, and Politics, the question—Which of them is true? demands, beyond all other questions whatever, the attention of scientific men."

As experiments suggested by those who believe in the inheritance of the effects of use and disuse would hardly carry the weight to those who do not believe in this inheritance which experiments proposed by themselves would, I write to suggest the desirability of undertaking an investigation which, Prof. Weismann thinks, would prove one or other hypothesis. He states it in the following words on p. 91 of the English edition of his "Essays":—

"If it is desired to prove that use and disuse produce hereditary effects without the assistance of natural selection, it will be necessary to domesticate wild animals (for example the wild duck) and preserve all their descendants, thus excluding the operation of natural selection. If then all individuals of the second, third, fourth, and later generations of these tame ducks possess identical variations, which increase from generation to generation, and if the nature of these changes proves that they must have been due to the effects of use and disuse, then perhaps the transmission of such effects may be admitted; but it must always be remembered that domestication itself influences the organism,—not only directly, but also indirectly, by the increase of variability as a result of the suspension of natural selection. Such experiments have not yet been carried out in sufficient detail."

If Profs. Weismann, Romanes, and Lankester, would agree to some such experiment as the above as definitely proving the point in question (I say "definitely," for the sentence which reads "if the nature of these changes proves that they must have been due to the effects of use and disuse," seems rather to beg the whole question, even if the experiment were carefully carried out), there are two ways in which it might be effected. One is, that the British Association, which by devoting time to the discussion of the hypothesis has shown an appreciation of its worth, should at its next meeting appoint a committee, with a small grant for necessary expenses, to carry out the investigation. The other is, that it should be undertaken independently by the foremost of those on both sides who are interested in this question, and who would no doubt subscribe among themselves enough for the purpose in view—at least, speaking for myself, I should not object to contribute to the expenses of a properly planned investigation.

Regarding the place where the "wild ducks," or possibly some animal with a more frequent recurrence of broods, should be located for observation, I would suggest that the Zoological Society should be asked to afford space in their Gardens at Regent's Park. F. HOWARD COLLINS.

Churchfield, Edgbaston.

Galls.

THE difficulty raised by Mr. Wetterhan (NATURE, February 27, p. 394) appears at first sight a serious one, but I think it vanishes on examination. Supposing the attacks of the insects to be constant, trees in their evolution would have to adapt themselves to these circumstances, just as they have adapted themselves to the environment of soil, air, light, wind, and so forth. But the fallacy (as it seems to me) of Mr. Wetterhan's argument lies in the supposition that the life of an oak-tree as such, and the life of an insect, may rightly be compared. A tree is really a sort of socialistic community of plants, which continually die and are supplanted by fresh. Bud-variation is a well-known thing, and in oaks A. de Candolle found many variations on the same tree. Now is it unreasonable to suppose that internal-feeding insects might take advantage of such variation—or rather, be obliged to take advantage of it, if it were in a direction to benefit the tree? I will give two purely hypothetical instances, to illustrate the points involved. Imagine two oak-trees, each with three branches, and each attacked by three internal-feeding insects. The insects infesting one tree are borers; those on the other tree are gall-makers. The borers bore into the branches, which they kill while undergoing their transformations: the tree possibly does not die that year, but next year the progeny of the three, being more numerous while the tree is weaker, effect its destruction, and finally the insects perish for want of food. On the other tree, the gall-makers do no appreciable damage, and the tree is

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